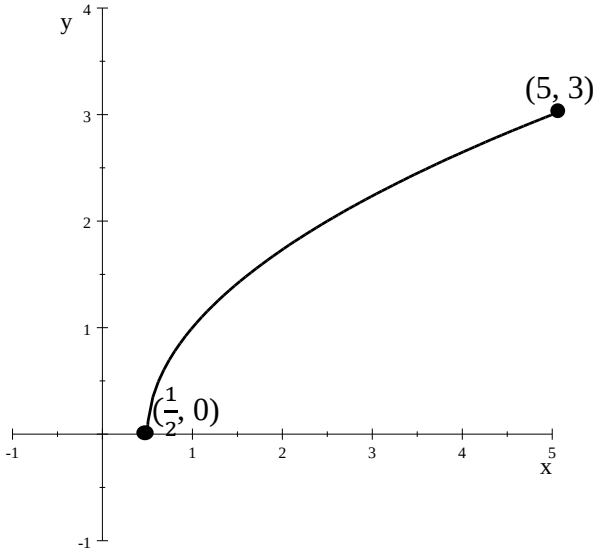
MA 15800 Review Worksheet for Exam 1, Summer 2016

1) Choose which of the following relations represent functions and give the domain and/or range.

a) $\{(2,5), (3,5), (-1,5)\}$

b) equation: $y = 2x^2 - 4x + 1$



c) graph:

d) table:

x	0	2	4	5	7	8
y	-2	-3	-4	-5	-4	-3

2) Given: $f(x) = \frac{3}{2}x^2 - 2x + 4$, find the following if they exist.

a) $f(-1)$

b) $f(2)$

c) $f(2x)$

d) $f(-x)$

e) $f(x) + 1$

f) $f(x-2)$

3) Given: $g(x) = \frac{3x-1}{x+1} + \sqrt{x+5}$, find the following if they exist.

a) $g(-1)$

b) $g(4)$

c) $g(-6)$

4) Given: $h(x)=\dfrac{x+1}{-2}$, find the following if they exist.

a) $h(7)$

b) $h(a+2)$

c) $h(a)+h(2)$

d) $h(\frac{3}{a})$

5) Given: $f(x)=3x-8$, solve $f(x)=0$ and find $f(0)$.

6) Write the domain of each function using interval notation.

a) $f(x)=\sqrt{5-x}$

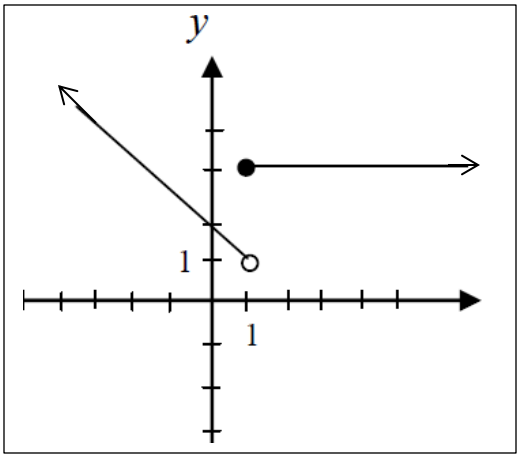
b) $g(x)=\dfrac{2x-1}{2x^2-7x-4}$

c) $j(x)=4x^4-3x^3$

d) $m(x)=\dfrac{2x}{x^2-4}$

e) $n(x)=\dfrac{23}{4-\sqrt{10x-24}}$

f) function represented by the graph



7) The volume *V* of a cube, in square inches, is a function of the length of one of its edges *x*, measured in centimeters. This relation is expressed by the formula $V(x)=x^3$. Give the logical domain of this function. Also, find $V(4)$ and solve $V(x)=512$.

8) The height of an object dropped from an initial height of $h=580$ feet is modeled by the function $h(t)=-16t^2+580$. Find the height of the object (to the nearest hundredth of a foot) after 1.75 seconds. Solve the equation $h(t)=592$ and round solution(s) to 2 decimal places.

9) An open top box with a square base of length *x* and height *y* is to be constructed so that its volume *V = 2016* cubic inches. If the cost of the material for the base of the box is \$0.92 per square inch and the cost of the sides is \$2.54 per square inch, express the cost *C* of the box in terms of the length of the base *x* (as a function of *x*).

10) Simplify: $\dfrac{\frac{1}{4}-\frac{2}{3}}{\frac{7}{12}}$

11) Simplify: $\dfrac{\frac{4}{x}+\frac{x}{4}}{\frac{1}{x}-4}$

12) Simplify: $\dfrac{\frac{8}{x+1}+\frac{8x}{x+4}}{\frac{4x}{x+1}-\frac{4}{x+4}}$

13) Simplify: $\dfrac{3}{1-\frac{4x}{8x-1}}$

14) Rationalize the root. (Rationalize the denominator.) $\dfrac{4}{8+\sqrt{x}}$

15) Rationalize the root. (Rationalize the numerator.) $\dfrac{\sqrt{3x}-\sqrt{8}}{9x^2-64}$

16) Rationalize the root. (Rationalize the denominator.) $\dfrac{4x^2-121}{\sqrt{2x}+\sqrt{11}}$

17) Simplify: $\dfrac{x^2-25}{x^2+3x-10}$

18) Divide: $\dfrac{5a^2+12a+4}{a^2-4} \div \dfrac{25a^2+20a+4}{a^2-2a}$

19) Combine as one rational expression: $\dfrac{6}{3x^2-2x}+\dfrac{5}{3x-1}-\dfrac{2}{x^2}$

20) Combine: $\dfrac{3y}{y+2}+\dfrac{5y}{y-2}-\dfrac{40}{y^2-4}$

21) Simplify: $\dfrac{\frac{2}{(x+h)^2}-\frac{2}{x^2}}{h}$

22) Simplify: $\dfrac{\frac{n}{m}-\frac{m}{n}}{\frac{1}{m}-\frac{1}{n}}$

23) Simplify: $\dfrac{\frac{a}{b}+\frac{b}{a}}{\frac{a^2}{b^2}-\frac{b^2}{a^2}}$

24) Factor the expression below. (Simplify.)
$(3x-2)^4(2)(x^2+5)(2x)+(x^2+5)^2(3)(3x-2)^3(6)$

25) Simplify. (Factor the expression.)

$(3x+1)^6\left(\frac{1}{2}\right)(2x-5)^{-1/2}(2)+(2x-5)^{1/2}(6)(3x+1)^5(3)$

26) Simplify, or in other words, factor the expression.

$-8(x^2+5)^{-5}(3-8x)^{-9}+72(x^2+5)^{-4}(3-8x)^{-10}$

27) Simplify, or in other words, factor the expression.

$(2x+1)^{1/4}(2x+5)^{5/6}+(2x+1)^{5/4}(2x+5)^{-1/6}$

28) If $f(x)=11x+13$ and $g(x)=x^2+3x$, find the following

a) $(g-f)(x)$ *b*) $(fg)(x)$

c) $\frac{f}{g}(-2)$ *d*) $(f+g)(15)$

29) Given the table below, find the following, if they exist.

x	1	2	3	4	5
$f(x)$	5	7	3	10	12
$g(x)$	3	2	5	6	0

a) $f(4)-g(3)$ *b*) $(fg)(4)$

c) $\left(\frac{f}{g}\right)(5)$ d) $4f(2)+2g(4)$

30) Given the table below, find the following, if they exist.

x	7	8	9	10	11
$f(x)$	10	7	9	11	8
$g(x)$	9	10	8	7	11

a) $(f\circ g)(10)$ *b*) $(g\circ f)(8)$

31) Let $f(x)=5x^2+4$ $g(x)=\frac{1}{2x}$ Find the following.

a) $(f\circ g)(x)$ *b*) domain of $(f\circ g)(x)$

c) $(g\circ f)(x)$ *d*) domain of $(g\circ f)(x)$

32) Given: $f(x)=\frac{x+3}{x-2}$ and $g(x)=\frac{2x+1}{3x-4}$ Find $(f\circ g)(x)$ and its domain.

33) For a certain species of tree, the average height of the tree after 2 years is 4 feet, and after 6 years the height of the tree is 16 feet. Assume that the annual growth of the tree is **linear** from 2 years to 20 years inclusive.
   a) Find the annual rate of change of the height of the tree in feet per year.
   b) Find a function for the height *h* of the tree in feet as a function of time in years.
   c) How tall will the tree be after 8 years?
   d) After how many years will the tree be 24 feet tall? Round your answer to the nearest tenth of a year.

34) Boat 1 leaves a dock headed due west at 8:00 AM traveling at a speed of 12 mph. At the same time a boat 2 leaves the dock headed due south traveling at a speed of 24 mph. Find an equation (function $d(t)$) that represents the distance *d* in miles between the two boats at any time *t* in hours.

35) A camp fire that was not extinguished spreads outward from a point in a circular path. The distance from the center of the fire to the outer edge of the fire is increasing at a rate of 6 feet per hour. Express the area encompassed by the fire *A* in terms of time *t* in hours.

36) Compute the average rate of change of the function $f(x)=x^2+3x$ over the interval [1, 5].

37) Express the average rate of change of the function $f(x)=2x^2+x$ over the interval $[x, x+h]$.

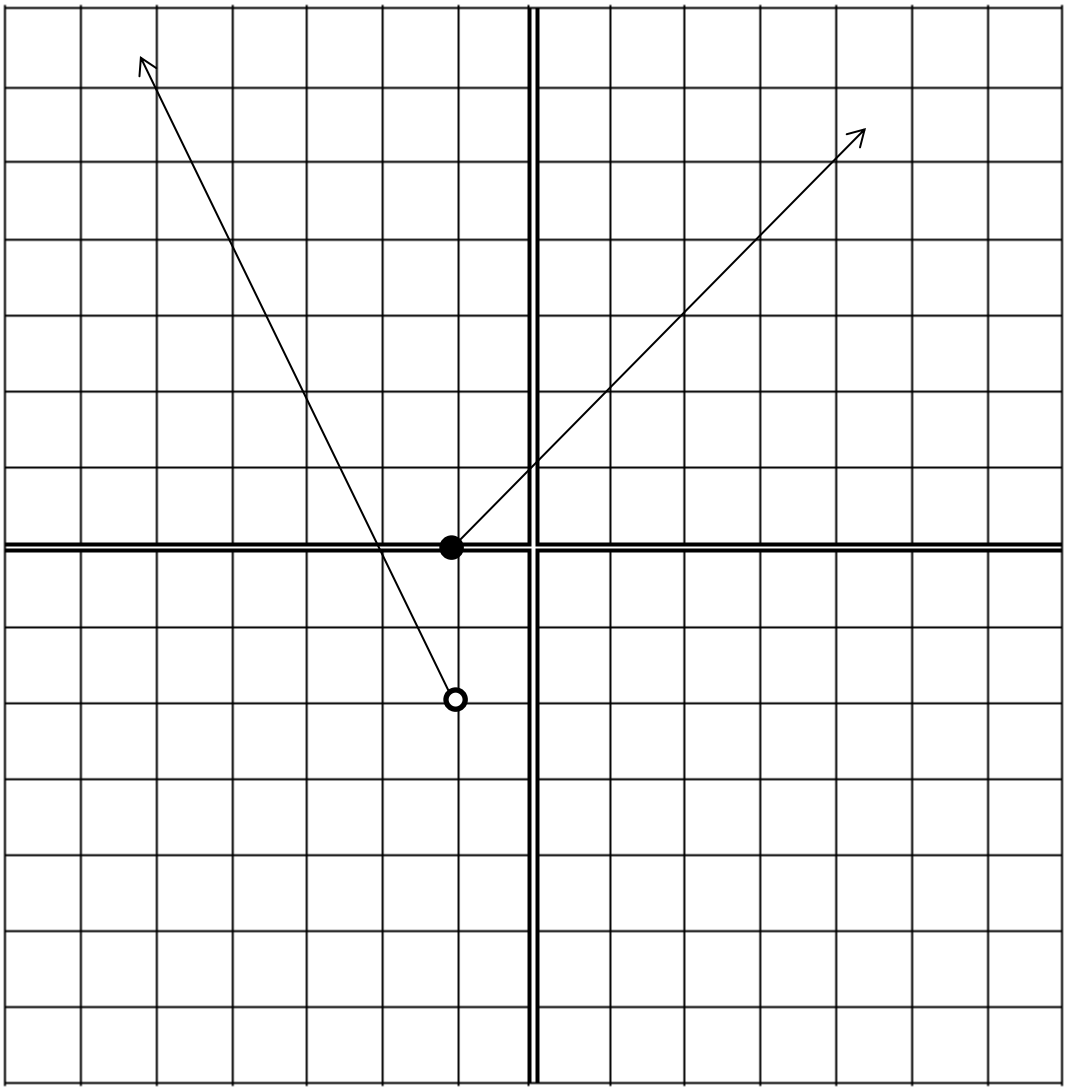
38) Find and simplify the difference quotient $\frac{f(x+h)-f(x)}{h}$ where $f(x)=x^2+2x-3$.

39) Find and simplify the difference quotient $\frac{f(x)-f(a)}{x-a}$ where $f(x)=2x+3$.

40) Find and simplify the difference quotient $\frac{f(5+h)-f(5)}{h}$ where $f(x)=x^2+7x$.

41) Find and simplify the difference quotient $\frac{f(x+h)-f(x)}{h}$ where $f(x)=\sqrt{5x}$.

42) Consider the following graph of a piece-wise defined function. Determine the function on the basis of the graph.



$$f(x)=\begin{cases}-2x-4 & if\ \ x\\ x+1 & if\ \ x\end{cases}$$

43) Given: $g(x)=\begin{cases}x-1 & if \quad x\le -2\\ x^2+2 & if \quad -2<x<1\\ \sqrt{x} & if \quad x\ge 1\end{cases}$ Compute the following function values.

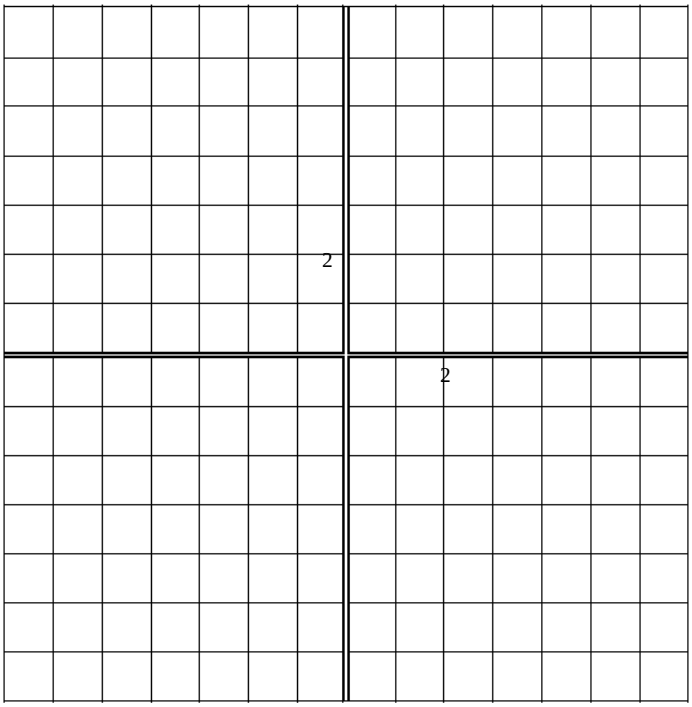
(*a*) $f(-2)=$

(*b*) $f(0)=$

(*c*) $f(1)=$

44) Sketch the following piece-wise defined function.

$$h(x)=\begin{cases}-x+3 & if \;\; x<-1\\ 1+2x & if \;\; x\geq -1\end{cases}$$



a) What is the domain of function *h*? the range of *h*?

45) A cellphone company offers two plans. The first plan costs \$30 a month for the first 100 minutes, and \$0.25 for each additional minute. The second plan costs \$50 a month for the first 180 minutes and \$0.40 for each additional minute. Find a piecewise function C_1 that determines the total cost per month using *x* minutes for the first plan. For the second plan.

46) Use the quadratic function $y=x^2+10x+80$ to answer the following questions.

(a) Write in equation of the parabola in standard form $y=a(x-h)^2+k$.
(b) Does the parabola open upward or downward?
(c) What is the vertex of the parabola?
(d) Does the function have a maximum or minimum value? What is that maximum or minimum value and where does it occur?

47) Write the quadratic function $f(x)=-2x^2-4x+1$ in standard form $y=a(x-h)^2+k$.

48) Find the vertex of the parabola with equation, $y=6x^2+10x-1$.

49) Find the maximum value of this parabola and where it occurs? $g(x)=-2x^2-4x+6$

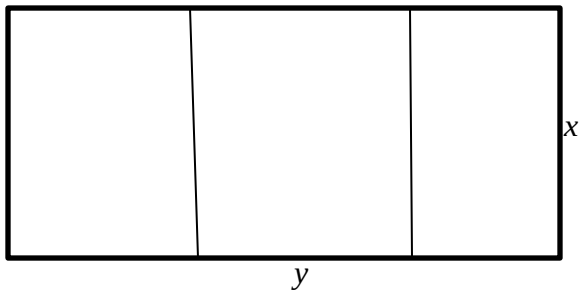
50) Find any zeros (locations of any *x*-intercepts) of this quadratic function.
$p(x) = 2x^2 - 3x - 5$ Find the *y*-intercept.

51) Find the standard equation of a parabola with a vertex at (2,1) and passing through the point (1,2).

52) Find the standard equation of a parabola with a zeros at 1 and 15 and passing through the point $(3, -1)$.

53) The sum of two integers is 14. Find the value of these two integers so that their product is a maximum, and find the maximum value of the product.

54) A farmer wishes to put fence around a rectangular field and then divide the field into three rectangular plots by placing two fences parallel to one of the sides. If the farmer can only afford 1000 yards of fencing, what dimensions will give the maximum rectangular area?



55) A car rental company has 528 cars. They can rent all 528 cars at a rate of $34 per day. They have determined that for every $1 increase in the rental cost, they will rent 3 fewer cars per day. Find the car rental rate that will maximize revenue for the company.